

**HYDAC**

**INTERNATIONAL**

**Proportional Valves,  
Directional Valves and  
Sandwich Plates for  
Hydropower Plants**





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## YOUR PARTNER FOR EXPERTISE IN CLOSED-LOOP CONTROL APPLICATIONS IN THE HYDROPOWER INDUSTRY

HYDAC proves its expertise with hydraulic and filtration solutions in all sectors – worldwide. Hydraulic systems, like no other technology driver, provide a high degree of operating safety and power density, compact design, fatigue strength, minimum maintenance and – in conjunction with electronics – excellent control and monitorability.

We offer power plant technology and service covering all aspects of oil hydraulics as well as project-specific design of hydraulic and fluid-power solutions in compliance with worldwide power plant standards and regulations.

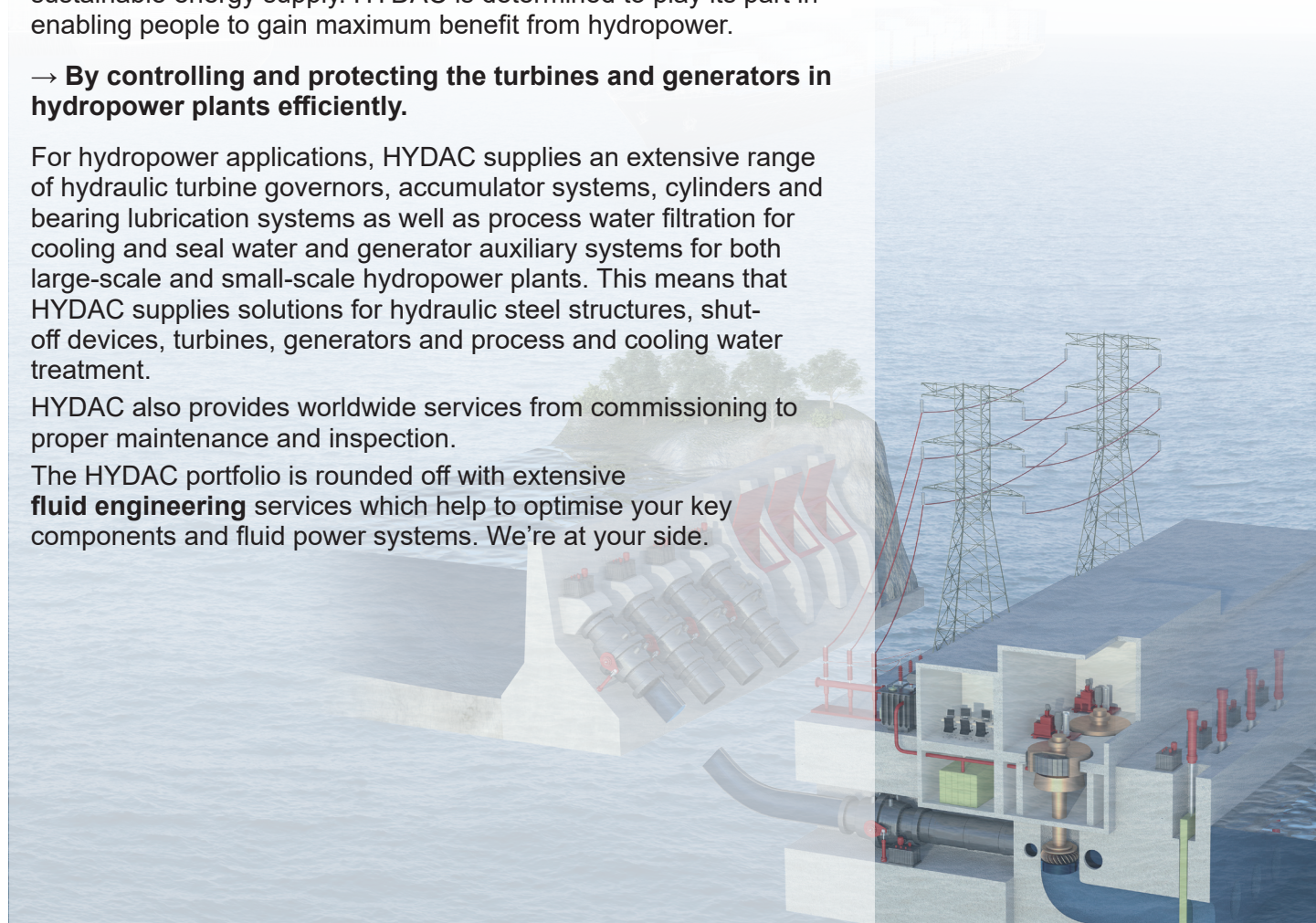
Hydropower plants today make a vital contribution to the world's sustainable energy supply. HYDAC is determined to play its part in enabling people to gain maximum benefit from hydropower.

→ **By controlling and protecting the turbines and generators in hydropower plants efficiently.**

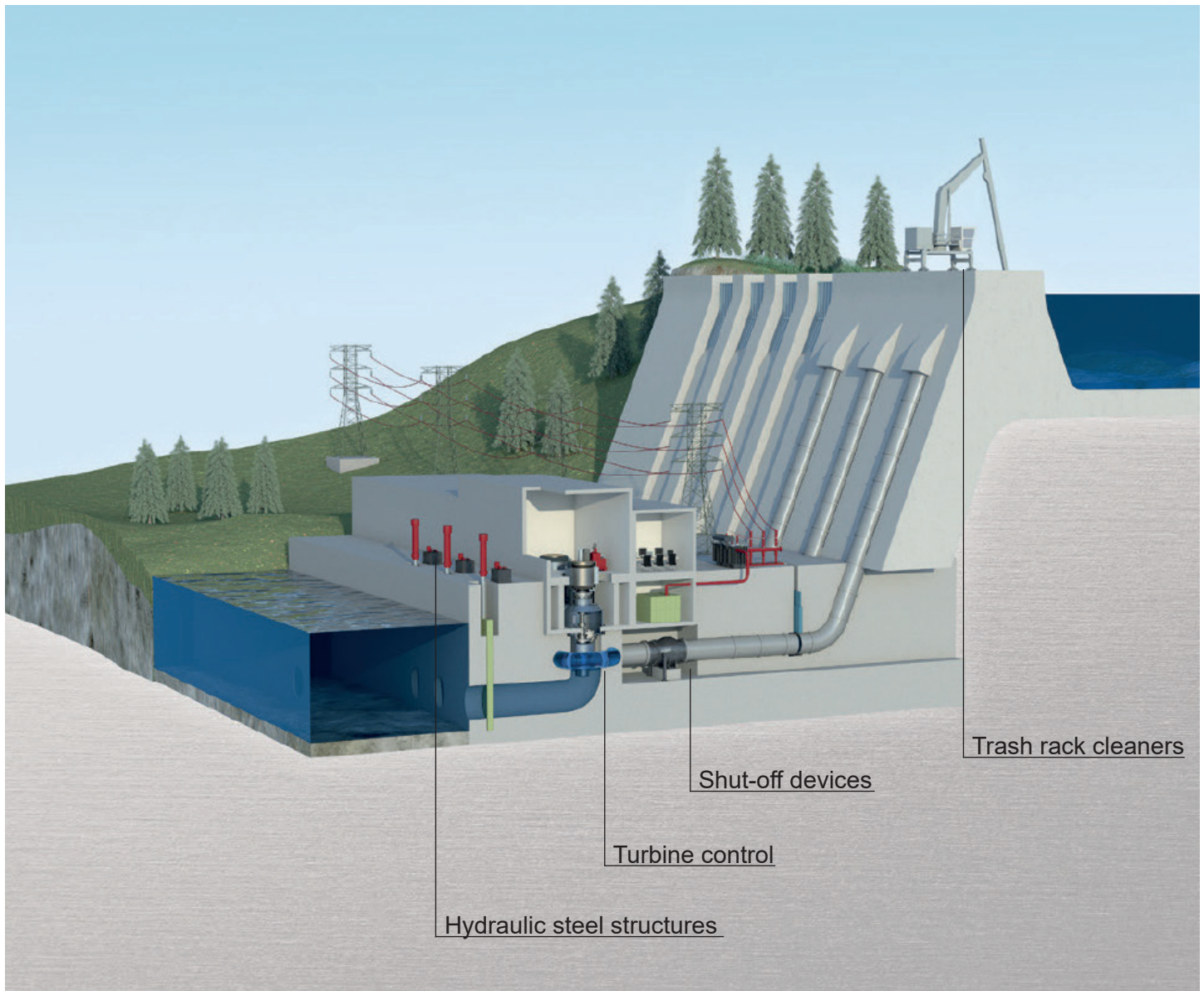
For hydropower applications, HYDAC supplies an extensive range of hydraulic turbine governors, accumulator systems, cylinders and bearing lubrication systems as well as process water filtration for cooling and seal water and generator auxiliary systems for both large-scale and small-scale hydropower plants. This means that HYDAC supplies solutions for hydraulic steel structures, shut-off devices, turbines, generators and process and cooling water treatment.

HYDAC also provides worldwide services from commissioning to proper maintenance and inspection.

The HYDAC portfolio is rounded off with extensive **fluid engineering** services which help to optimise your key components and fluid power systems. We're at your side.



# 1. CLOSED-LOOP CONTROL APPLICATIONS IN HYDROPOWER PLANTS



## 1.1 EXAMPLES

Accurate and reliable control of the actuators is particularly important in closed-loop control applications. Here are some specific application examples:

### Hydraulic steel structures

- Weirs
- Weir shutters
- Sluice gates

### Hydraulics for turbine control

- Runners
- Guide vanes
- Brakes
- Pelton nozzles
- Deflectors

### Hydraulics for shut-off devices

- Ball valve control
- Butterfly valves
- Safety-related control

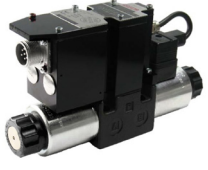
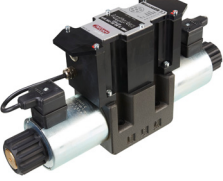

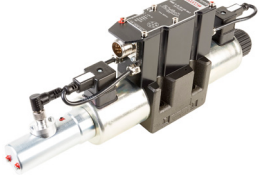
### Hydraulics for trash rack cleaners

- Rakes
- Lifting cylinders
- Pressing cylinders

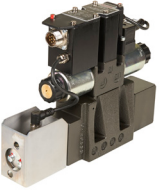
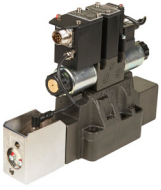
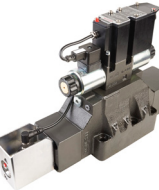
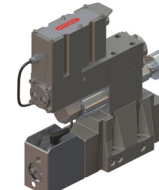
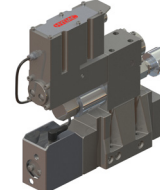


## 2. TECHNICAL DATA

### 2.1 PROPORTIONAL VALVES



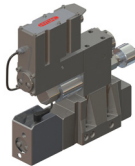

Nominal size	Size 6	Size 10	Size 6	Size 10
Type	P4WEE		P4WERE	
Series	P01			
				
Features	<ul style="list-style-type: none"> <li>● Electrically direct-acting</li> <li>● Interface CETOP 4.2-4 03-350 ISO 4401-03-02-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics</li> <li>● Spool symbol, main stage E, Q</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically direct-acting</li> <li>● Interface CETOP 4.2-4 05-350 ISO 4401-05-04-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics</li> <li>● Spool symbol, main stage E, Q</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically direct-acting</li> <li>● Interface CETOP 4.2-4 03-350 ISO 4401-03-02-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position</li> <li>● Spool symbol, main stage E, Q, zero cut Z, ZR, FZ</li> <li>● Fail-safe position: Symbol FZ with P-B/A-T approx. 6% opened</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically direct-acting</li> <li>● Interface CETOP 4.2-4 05-350 ISO 4401-05-04-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position</li> <li>● Spool symbol, main stage E, Q, EA, QA, zero cut Z</li> <li>● Fail-safe position: Symbol FZ with P-B/A-T approx. 6% opened</li> </ul>
Nominal flow rate @ $\Delta p$ 10 bar P-T	1 l/min 4 l/min 8 l/min 16 l/min 16/8 l/min 26 l/min 26/13 l/min	30 l/min 60 l/min 60/30 l/min	1 l/min 4 l/min 12 l/min 18 l/min (E spool) 30 l/min 30/15 l/min	50 l/min 70/35 l/min 75 l/min
Max. flow rate	40 l/min	90 l/min	80 l/min	180 l/min
Max. operating pressure P,A,B / T T (pilot oil external) T (pilot oil internal)	350 bar / 210 bar			





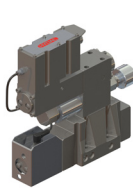


Size 10	Size 16	Size 25	Size 32	Size 35
<b>P4WEHRE</b>				
<b>P01</b>				
				
<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 05-350 ISO 4401-05-05-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position of the main stage</li> <li>● Spool symbol, main stage E, Q</li> <li>● Options for external and internal pilot/drain line</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 07-350 ISO 4401-07-07-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position of the main stage</li> <li>● Spool symbol, main stage E, Q</li> <li>● Options for external and internal pilot/drain line</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 08-350 ISO 4401-08-08-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position of the main stage</li> <li>● Spool symbol, main stage E, Q</li> <li>● Options for external and internal pilot/drain line</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 10-350 ISO 4401-10-09-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position of the main stage</li> <li>● Spool symbol, main stage E, Q</li> <li>● Options for external and internal pilot/drain line</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 10-350 ISO 4401-10-09-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● With integrated electronics and position sensor to determine the spool position of the main stage</li> <li>● Spool symbol, main stage E, Q</li> <li>● Options for external and internal pilot/drain line</li> </ul>
80 l/min	100 l/min 150 l/min	200 l/min 300 l/min	350 l/min 500 l/min	800 l/min
180 l/min	450 l/min	800 l/min	1600 l/min	2800 l/min
350 bar 250 bar 10 bar				

## 2. TECHNICAL DATA

### 2.2 CONTROL VALVES

Nominal size	Size 6	Size 10	Size 10	Size 16
Type	C4WERE 6 Z+Y	C4WERE 10 Z+Y	C4WEHRE E 10 Z+Y	C4WEHRE E 16 Z+Y
Series	P01			
				
Features	<ul style="list-style-type: none"> <li>● Electrically direct-acting</li> <li>● Interface CETOP 4.2-4 03-350 ISO 4401-03-02-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Control spool in sleeve</li> <li>● Symbol Z “zero cut” for top control quality</li> <li>● Control valve with feedback and integrated electronics</li> <li>● Fail-safe position: Symbols E, J and Y (100% opened) available</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically direct-acting</li> <li>● Interface CETOP 4.2-4 05-350 ISO 4401-05-04-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Control spool in sleeve</li> <li>● Symbol Z “zero cut” for top control quality</li> <li>● Control valve with feedback and integrated electronics</li> <li>● Fail-safe position: Symbols E, J and Y (100% opened) available</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 R05-350 ISO 4401-05-05-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Options for external and internal pilot/ drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage “zero cut” Z</li> <li>● Fail-safe position Main stage: P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 07-350 ISO 4401-05-04-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Options for external and internal pilot/ drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage “zero cut” Z</li> <li>● Fail-safe position Main stage P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>
Nominal flow rate	<b>@<math>\Delta p</math> 70 bar P-T</b> 1 l/min 4 l/min 5 l/min 10 l/min 20 l/min 40 l/min	<b>@<math>\Delta p</math> 70 bar P-T</b> 60 l/min 100 l/min	<b>@<math>\Delta p</math> 10 bar P-T</b> 100 l/min	<b>@<math>\Delta p</math> 10 bar P-T</b> 120 l/min 220 l/min
Max. flow rate	70 l/min	180 l/min	180 l/min	450 l/min
Max. operating pressure P,A,B / T,X,Y	350 bar / 250 bar			




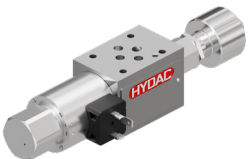


Size 25	Size 32	Size 35	Size 16	Size 25
C4WEHRE E 25 Z+Y	C4WEHRE E 32 Z+Y	C4WEHRE E 35 Z+Y	C5WEHRE E 16	C5WEHRE E 25
P01				
				
<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 08-350 ISO 4401-08-08-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Options for external and internal pilot/drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage "zero cut" Z</li> <li>● Fail-safe position Main stage P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 10-350 ISO 4401-10-09-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Options for external and internal pilot/drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage "zero cut" Z</li> <li>● Fail-safe position Main stage P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface CETOP 4.2-4 10-350 ISO 4401-10-09-0-05</li> <li>● 4/3 proportional directional valve</li> <li>● Options for external and internal pilot/drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage "zero cut" Z</li> <li>● Fail-safe position Main stage P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface ISO 4401-07-07-0-05+R</li> <li>● 5/3 proportional directional valve</li> <li>● Options for external and internal pilot/drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage "zero cut" Z</li> <li>● Fail-safe position Main stage P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically pilot-operated</li> <li>● Interface ISO 4401-08-08-0 05+R</li> <li>● 5/3 proportional directional valve</li> <li>● Options for external and internal pilot/drain line</li> <li>● Control valve with integrated electronics and double feedback</li> <li>● Spool symbol, main stage "zero cut" Z</li> <li>● Fail-safe position Main stage P-B/A-T (100% opened)</li> <li>● Sandwich plates actuated electrically or hydraulically, with/without switch position monitoring</li> </ul>
<b>@Δp 10 bar P-T</b> 250 l/min 450 l/min	<b>@Δp 10 bar P-T</b> 800 l/min	<b>@Δp 10 bar P-T</b> 1000 l/min	<b>@Δp 10 bar P-T</b> 220 l/min	<b>@Δp 10 bar P-T</b> 400 l/min
900 l/min	1600 l/min	3500 l/min	450 l/min	900 l/min

350 bar / 250 bar





## 2. TECHNICAL DATA

### 2.3 SANDWICH PLATES

Nominal size	Size 6			
Type	ZW-4WE 6 X163	ZW-4WE 6 X181	ZW-4WER0 6 X163	ZW-4WER0 6 X181
				
<b>Features</b>	<ul style="list-style-type: none"> <li>● Electrical</li> <li>● 6/2 directional valve sandwich plate</li> <li>● 24 VDC supply voltage plug connector to EN 175301-803</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves size 6</li> <li>● For pilot-operated 4/3 control valves in size 10 and 16</li> <li>● Fail-safe position P-B/A-T</li> </ul>	<ul style="list-style-type: none"> <li>● Electrical</li> <li>● 6/2 directional valve sandwich plate</li> <li>● 24 VDC supply voltage plug connector to EN 175301-803</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves size 6</li> <li>● For pilot-operated 4/3 control valves in size 25, 32 and 35</li> <li>● Fail-safe position P-A/B-T</li> </ul>	<ul style="list-style-type: none"> <li>● Electrical</li> <li>● 6/2 directional valve sandwich plate</li> <li>● 24 VDC supply voltage plug connector to EN 175301-803</li> <li>● Position-monitored with a position sensor</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves in size 6</li> <li>● For pilot-operated 4/3 control valves in size 10 and 16</li> <li>● Fail-safe position P-B/A-T</li> </ul>	<ul style="list-style-type: none"> <li>● Electrical</li> <li>● 4/2 directional valve sandwich plate</li> <li>● 24 VDC supply voltage plug connector to EN 175301-803</li> <li>● Position-monitored with a position sensor</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves in size 6</li> <li>● For pilot-operated 4/3 control valves in size 25, 32 and 35</li> <li>● Fail-safe position P-A/B-T</li> </ul>
<b>Max. flow rate</b>	40 l/min			
<b>Max. operating pressure P,A,B / T</b>	350 bar / 210 bar			



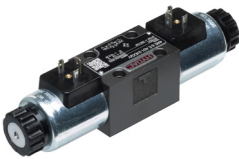





Size 6

ZW-4WH 6 X163	ZW-4WE 6 X181	ZW-4WER0 6 X163	ZW-4WER0 6 X181
			
<ul style="list-style-type: none"> <li>● Hydraulic</li> <li>● 6/2 directional valve sandwich plate</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves in size 6</li> <li>● For pilot-operated 4/3 control valves in size 10 and 16</li> <li>● Fail-safe position P-B/A-T (100% opened)</li> </ul>	<ul style="list-style-type: none"> <li>● Hydraulic</li> <li>● 6/2 directional valve sandwich plate</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves in size 6</li> <li>● For pilot-operated 4/3 control valves in size 25, 32 and 35</li> <li>● Fail-safe position P-A/B-T (100% opened)</li> </ul>	<ul style="list-style-type: none"> <li>● Hydraulic</li> <li>● 6/2 directional valve sandwich plate</li> <li>● Position-monitored with a position sensor</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves in size 6</li> <li>● For pilot-operated 4/3 control valves in size 10 and 16</li> <li>● Fail-safe position P-B/A-T (100% opened)</li> </ul>	<ul style="list-style-type: none"> <li>● Hydraulic</li> <li>● 6/2 directional valve sandwich plate</li> <li>● Position-monitored with a position sensor</li> <li>● For 4/3 proportional directional valve</li> <li>● For direct-acting 4/3 control valves in size 6</li> <li>● For pilot-operated 4/3 control valves in size 25, 32 and 35</li> <li>● Fail-safe position P-A/B-T (100% opened)</li> </ul>
40 l/min			
350 bar / 210 bar			

## 2. TECHNICAL DATA

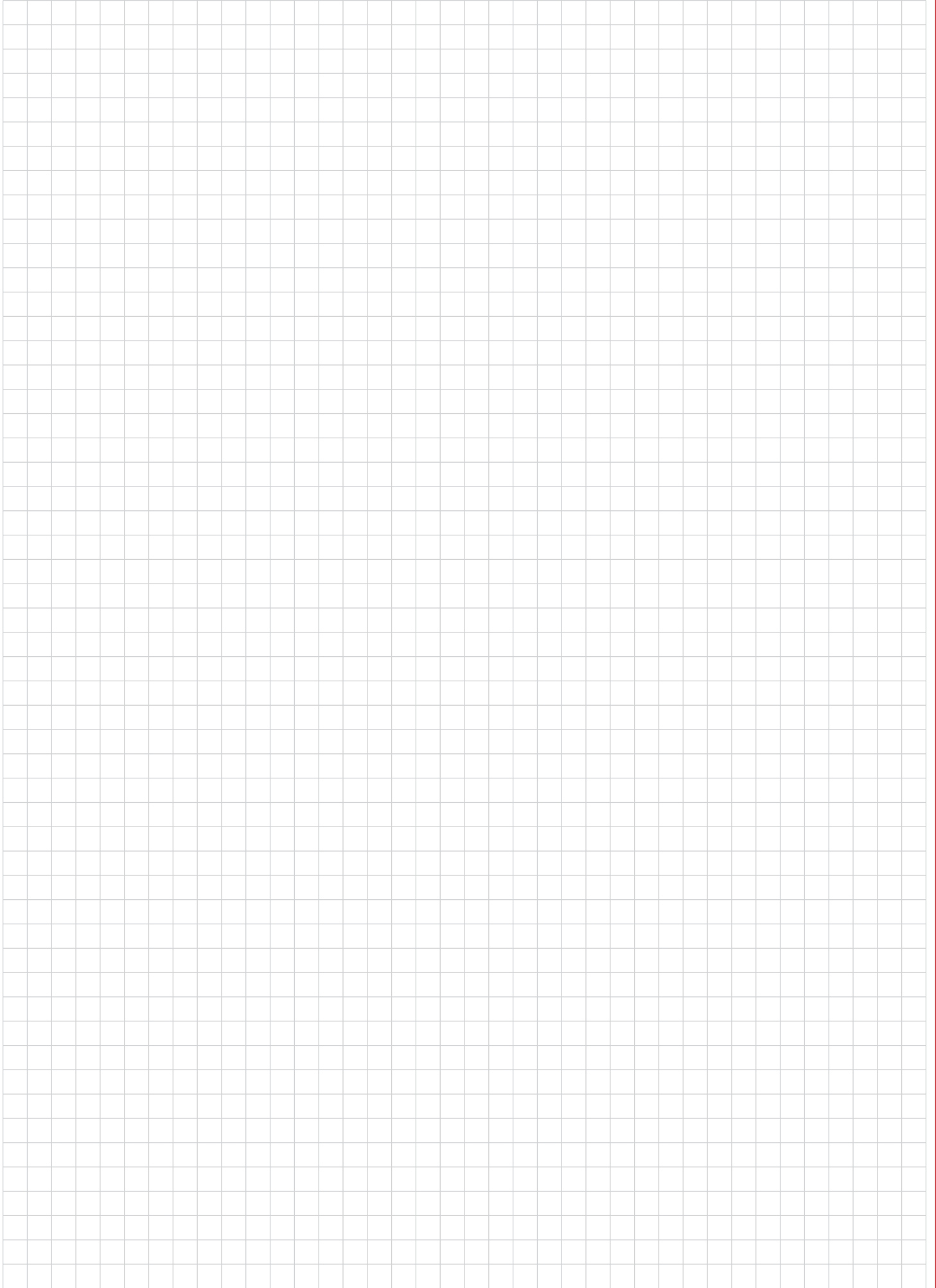
### 2.4 DIRECTIONAL SPOOL VALVES

Nominal size	Size 6		
Type	WSE 6	WSER 6	4WE 6
Series	H01	H01	A01
			
Features	<ul style="list-style-type: none"> <li>● Electrically operated</li> <li>● 2/2-, 3/2-, 3/3-, 3/4-, 4/2-, 4/3- and 4/4 directional poppet valves</li> <li>● Patented functional principle</li> <li>● High switching safety thanks to pressure-compensated design</li> <li>● DC or AC solenoids</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically operated</li> <li>● 2/2 and 3/2 directional poppet valves with switch position monitoring</li> <li>● Patented functional principle</li> <li>● High switching safety thanks to pressure-compensated design</li> <li>● DC or AC solenoids</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically operated</li> <li>● 4/2 and 4/3 directional spool valves</li> <li>● DC or AC solenoids</li> <li>● Electrical connection as a single connection or central connection</li> </ul>
Max. flow rate	25 l/min	12 l/min	80 l/min
Max. operating pressure P,A,B / T	350 bar / 70 bar	350 bar / 70 bar	350 bar / 210 bar

Nominal size	Size 6	Size 10	Size 10
Type	4WER 6	4WE 10	4WER 10
Series	S01	A01	S01
			
Features	<ul style="list-style-type: none"> <li>● Electrically operated</li> <li>● 4/2 and 4/3 directional spool valves with switch position monitoring</li> <li>● DC or AC solenoids</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically operated</li> <li>● 4/2 and 4/3 directional spool valves</li> <li>● DC or AC solenoids</li> </ul>	<ul style="list-style-type: none"> <li>● Electrically operated</li> <li>● 4/2 and 4/3 directional spool valves with switch position monitoring</li> <li>● DC or AC solenoids</li> </ul>
Max. flow rate	80 l/min	160 l/min	120 l/min
Max. operating pressure P,A,B / T	350 bar / 210 bar		

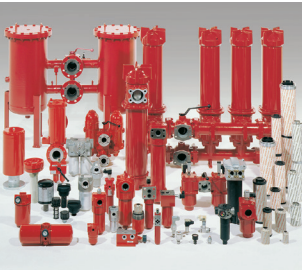
Further information on request!







Accumulators 30.000



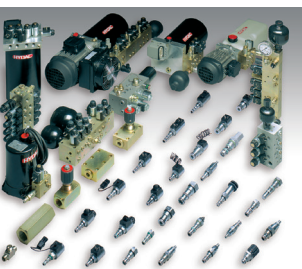
Filter Technology 70.000



Process Technology 77.000



Filter Systems 79.000



Compact Hydraulics 53.000



Accessories 61.000

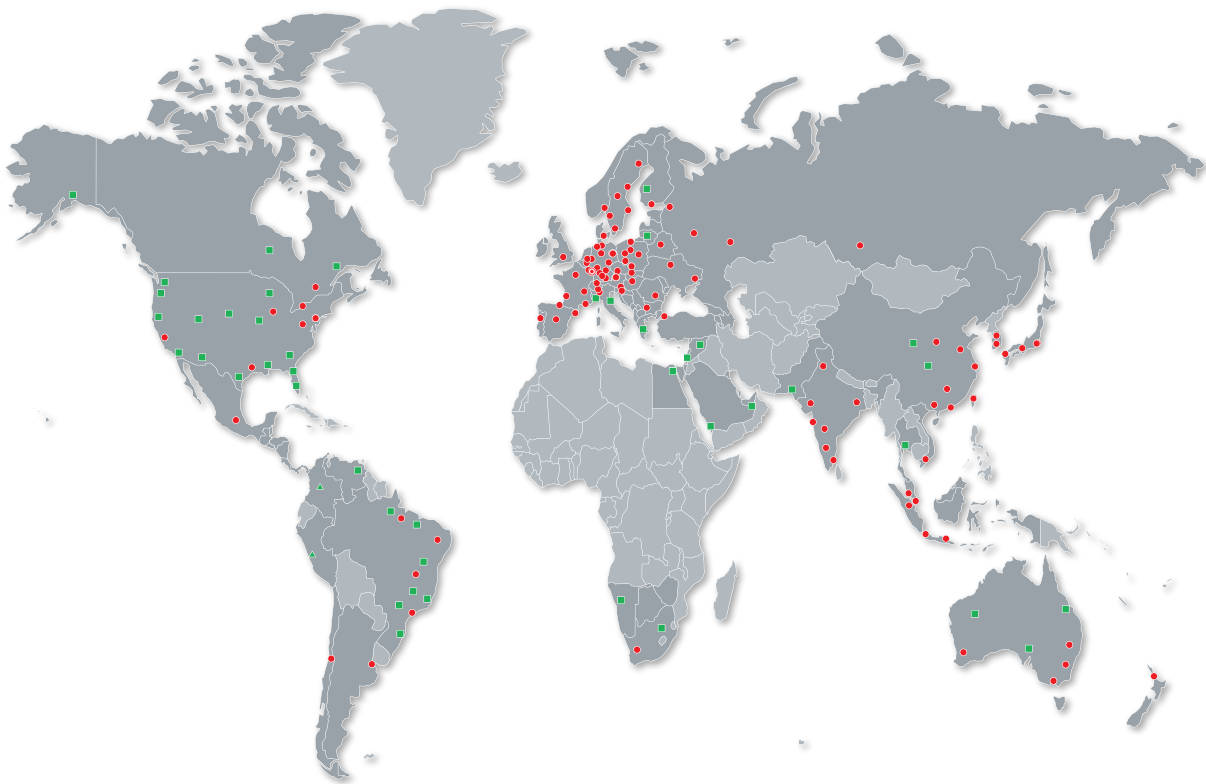


Electronics 180.000



Cooling Systems 57.000

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- ▲ Free Sales Partners

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### NOTE

The information in this brochure relates to the operating conditions and applications described. For applications and/or operating conditions not described, please contact the relevant technical department. Subject to technical modifications.